CP&L

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OCT 2 0 2000

10 CFR 50.73

SERIAL: BSEP 00-0152

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-324/LICENSE NO. DPR-62
LICENSEE EVENT REPORT 2-00-002

Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Part 50.73, Carolina Power & Light Company submits the enclosed Licensee Event Report. This report fulfills the requirement for a written report within thirty (30) days of a reportable occurrence.

Please refer any questions regarding this submittal to Mr. David C. DiCello, Manager - Regulatory Affairs, at (910) 457-2235.

Sincerely,

[redacted] J. Gannon For
ant General Manager
Brunswick Steam Electric Plant

SFT/sft

Enclosure: Licensee Event Report

IE22

cc (with enclosure):

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NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)
Main Transformer Fault Results in Reactor Scram

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
09	22	2000	2000	002	00	10	20	2000	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)	X	50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A	
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Steve Tabor, Project Analyst - Regulatory Affairs	(910) 457-2178

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
D	EL	XFMR	General Electric Company	Y	B	SJ	LCV	Fisher Valve Company	Y

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On September 22, 2000, at 0340 hours, the Brunswick Steam Electric Plant (BSEP) Unit No. 2, was operating at 100 percent rated thermal power, when the Unit 2 B phase of the Main Power Transformer (U2 B MPT) experienced a fault resulting in a generator load reject and subsequent turbine trip and reactor scram. In addition, Primary Containment Isolation System Groups 2, 6, and 8 valve isolations/signals initiated as expected. The transformer fault was caused by a loss of cooling. The loss of cooling system is attributed to the tripping of an electrical breaker, which provided alternate power to the transformer cooling components (i.e., 480 V distribution panel 2-HB4 circuit breaker #7). The cause of the breaker tripping has not been conclusively determined. At the time of the event, the U2 B MPT auxiliaries were being powered from the alternate 480 V source due to maintenance that was being performed on the normal source. The causes of the event include the unexplained trip of the 2-HB4 circuit breaker #7 and the failure to establish adequate compensatory measures during the maintenance activity. Corrective actions include replacement of the U2 B MPT and 2-HB4 circuit breaker #7. In addition, enhancements to the work control process, procedure revisions, and event review with appropriate site personnel will be performed to preclude recurrence. The safety significance of this event is minimal since off-site power remained available throughout the event and all emergency diesel generators were operable.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

INITIAL CONDITIONS

On September 21, 2000, with Unit 2 operating at 100 percent of rated thermal power, maintenance activities to refurbish the Unit 2 Main Power Transformer [JT]/(MPT) 480 V distribution panel 2-HB3 were initiated. The 2-HB3 and 2-HB4 distribution panel circuit breakers [BKRs] provide the primary and alternate 480 V power supplies, respectively, for MPT cooling components. At approximately 1012 hours, distribution panel 2-HB3 was de-energized. Distribution panel 2-HB4 had been aligned to provide power to the Phase B of the MPT (U2 B MPT) cooling and temperature protection related components during the 2-HB3 maintenance. This configuration sealed-in the U2 B MPT trouble annunciator (i.e., UA-13-5-4) and masked further annunciation of MPT abnormal conditions.

At approximately 1605 hours, control room personnel were informed that the work on the 2-HB3 distribution panel had been stopped due to inclement weather and would not be completed until the next day.

The off-site electrical distribution and Emergency Diesel Generators [DG]/(EDGs) were fully operable.

EVENT DESCRIPTION

Based on information obtained following the event described below, distribution panel 2-HB4 circuit breaker #7 tripped on September 21, 2000, at 2330 hours. On September 22, 2000, at 0340 hours, an automatic reactor scram occurred due to a Generator Transformer Differential and Main Transformer Fault Pressure Relay trip signal and subsequent Main Generator Lockout and Turbine trip. In addition the following actions occurred:

- Due to the Main Generator Lockout signal, EDGs 1, 2, 3, and 4 automatically started, as designed, but did not load since a loss of off-site power did not occur.
- The 2C and 2D 4KV Balance of Plant electrical busses automatically aligned to off-site power through the Startup Auxiliary Transformer (SAT) as designed.
- As expected, a decrease in reactor water level occurred following the scram. Reactor water level decreased below the low level 1 setpoint (i.e., 166 inches of water above the top of active fuel) resulting in the automatic closure of Primary Containment Isolation System [JM]/(PCIS) Groups 2 (i.e., Drywell Floor and Equipment Drain Valves) and 6 isolation valves (i.e., Containment Atmospheric Control Valves).
- Automatic actuation of the PCIS Group 8 (i.e., Shutdown Cooling) isolation logic occurred as a result of the low level 1 condition; however, the valves were in the closed position at the time of the occurrence.
- The 2A Reactor Feed Pump [P/SJ] was manually tripped in accordance with emergency operating procedures.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

These effects were expected, in accordance with plant design; Unit 2 operators responded appropriately to the effects, as plant conditions warranted. No Emergency Core Cooling Systems actuated. Reactor water level was controlled using feedwater injection.

At 0346 hours, a fire in the U2 B MPT was reported to the control room. The 2A, 2B, and 2C MPT deluge systems actuated. An Unusual Event (UE) was declared at 0400 in accordance with emergency procedures due to a fire in the protected area lasting greater than 10 minutes. The site fire brigade responded and through the combination of fire hoses and the automatic deluge system, the fire was extinguished at 0402 hours. The UE was terminated at 0512 hours. During the MPT fire suppression activities, a mixture of oil and water escaped the concrete reservoir and spilled to the ground surrounding the transformer.

At 0351 hours, following the initial scram, the 2B Reactor Feed Pump tripped on high water level (i.e., reactor water level reached 214 inches). While attempting to restore feedwater injection, the Startup Level Control Valve [SJ/LCV]/(SULCV) 2-FW-LV-3269 would not open. Reactor water level decreased to 122 inches before being restored using the 2-FW-V120 bypass valve. This level transient resulted in a second automatic Reactor Protection System [JD]/(RPS) trip actuation signal; however, all control rods were in the full-in position. The PCIS logic had not been reset prior to experiencing the second RPS actuation signal.

At 0354 hours, the RPS trip signal was reset. At 0415 hours, the PCIS logic was reset. By 1746 hours, Unit 2 was in cold shutdown.

Notifications associated with this occurrence were made to the NRC in accordance with 10 CFR 50.72(b)(2)(ii) and 50.72(b)(2)(vi). Reference Event Numbers: 37364 and 37365. This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv), as an event that resulted in an automatic actuation of an engineered safety feature (i.e., PCIS and RPS).

As designed, the loss of the main generator results in an automatic transfer from the normal circuit (i.e., main generator output via the Unit Auxiliary Transformer (UAT) to the SAT. During this occurrence, a momentary electrical transient occurred during the circuit transfer which resulted in the following actuations:

- A partial PCIS Group 3 Reactor Water Cleanup system [CE]/(RWCU) isolation occurred, which caused valve 2-G31-F001 to close.
- The Unit 2 Turbine Building Wide Range Gas Monitor [NM/MON] tripped.
- A lockout of the 2A Reactor Recirculation System [AD] Motor Generator Set [MG] Scoop Tube occurred.
- The 2A and 2B Turbine Building Chillers [VK] tripped.
- The Unit 2 Fuel Pool Cooling System [DA] tripped.

Following the occurrence, the affected components were returned to service satisfactorily.

EVENT CAUSE

Investigation has determined that the U2 B MPT failed due to the loss of its cooling system (i.e., fans, oil pumps), resulting in the overheating and breakdown of the transformer winding insulation dielectric and a subsequent transformer fault. The cooling system loss is attributed to the unexplained tripping of 2-HB4 circuit breaker #7. An additional event root cause is the failure to establish adequate compensatory measures during the maintenance activity. The masking of control room annunciation during the distribution panel maintenance activity allowed the loss of cooling to the MPT to proceed for four hours with the control room unaware of this condition until the U2 B MPT failed. Inadequate procedural guidance for implementing compensatory actions, inadequate communications, and deficiencies within the work control and work planning processes are key-contributors to the failure to implement adequate compensatory measures. The cause of the breaker tripping has not been conclusively determined; however, the potential causes include spurious breaker malfunction, cable/component failures that become evident only under sustained full load on the alternate power supply, and a high resistance condition for a single phase downstream of the tripped breaker causing an over current for the remaining phases.

CORRECTIVE ACTIONS

Actions Taken:

- An evaluation was performed to identify lighted and disabled annunciators that could mask other inputs and appropriate compensatory measures were implemented.
- Standing Instruction 00-050 was issued requiring specific compensatory measures to be implemented in the event annunciator UA-13-5-4, Main XFMR Trouble, is sealed-in and, as appropriate, for other transformers.
- Standing Instruction 00-049 was issued to establish interim process changes for (1) identifying plant effects of activities including effects on monitoring capabilities and (2) implementing appropriate compensatory actions for those effects. This Standing Instruction was reviewed with affected personnel prior to Unit startup.
- Operating Instruction, 0OI-01.08, Control of Equipment and System Status, was revised to require sealed-in annunciators to be assessed by the Unit Senior Control Operator (SCO). This revision requires the Unit SCO to take compensatory actions to adequately monitor parameters affected by the sealed-in alarm.
- The U2 B MPT was replaced and testing of cooling systems and associated power supplies was completed prior to Unit restart.
- The impact of the occurrence on surrounding components including the Phase A and Phase C MPTs was assessed and actions were taken as necessary to ensure component functionality. As part of this effort, Phase A and Phase C MPT oil and gas samples were determined to be within specification.
- 2-HB4 circuit breaker #7 was replaced.

- Investigation into the cause of the SULCV failure to open during this occurrence determined that the valve actuator piston o-rings were degraded, resulting in excessive internal actuator leakage, which prevented the valve from opening against high differential pressure. The o-rings were replaced with a product less susceptible to failure in this manner.
- A vendor specializing in environmental cleanup was utilized to remove the oil from the ground surrounding the transformer. The oily water mixture remaining in the transformer reservoir overflowed, as designed, to the storm drain collection basin and was contained. Site personnel vacuumed the basin and placed the installed oil skimmer in service prior to Unit 2 startup. Based on these actions, the oil released from the transformer never reached State waters and poses no environmental hazard.

Actions Planned:

- A multi-discipline team will determine the procedure changes necessary to implement the process changes addressed within Standing Instruction 00-049 and the resulting procedure revisions will be implemented.
- The appropriate annunciator procedures will be revised to add information on transformer loss of cooling effects and applicable compensatory measure options.
- Investigation into the cause of the 2-HB4 circuit breaker #7 trip will continue. Additional component failure testing is needed to complete this investigation. In the event the additional testing determines a different cause for the breaker trip, a supplement to this report will be submitted to address the final determination.
- This occurrence and associated root cause/lessons learned will be reviewed with appropriate Engineering, Outages and Scheduling, Environmental and Radiation Control, Maintenance, and Operations personnel. Human performance principles and personnel accountability related to the event will be the focus of this review.

SAFETY ASSESSMENT

The safety significance of this event is minimal since off-site power remained available throughout the event and all EDGs were operable. The transformer fire was quickly contained, remained localized, and never threatened other equipment important to safety. While scrams and generator load rejects are undesirable transients, major plant equipment operated correctly to minimize the effects of the transients.

Although it is recognized that a potential for personnel injury did exist due to the electrical fault and subsequent fire that occurred, no one was in the transformer area at the time of the occurrence, and therefore, injuries to site personnel did not occur.

PREVIOUS SIMILAR EVENTS

A review of events for the past three years has not identified any similar events involving the failure of a main transformer (i.e., MPT, UAT, or SAT).

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

COMMITMENTS

Those actions committed to by Carolina Power & Light (CP&L) Company in this document are identified below. Any other actions discussed in this submittal represent intended or planned actions by CP&L. They are described for the NRC's information and are not regulatory commitments. Please notify the Manager - Regulatory Affairs of any questions regarding this document or any associated regulatory commitments.

- A multi-discipline team will determine the procedure changes necessary to implement the process changes addressed within Standing Instruction 00-049 and the resulting procedure revisions will be implemented by March 31, 2001.
- The appropriate annunciator procedures will be revised by January 15, 2001, to add information on transformer loss of cooling effects and applicable compensatory measure options.
- Investigation into the cause of the 2-HB4 circuit breaker #7 trip will continue. Additional component failure testing is needed to complete this investigation. This investigation will be completed by January 15, 2001.